NON-PUBLIC?: N
ACCESSION #: 9108220112
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Palisades Plant PAGE: 1 OF 06

DOCKET NUMBER: 05000255

TITLE: Plant Trip Following Main Feedwater Pump Trip
EVENT DATE: 07/12/91 LER #: 91-015-00 REPORT DATE: 08/12/91

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Cris T Hillman, Licensing Engineer TELEPHONE: (616) 764-8913

COMPONENT FAILURE DESCRIPTION:
CAUSE: A SYSTEM: SL COMPONENT: PI MANUFACTURER:
X SL 69
REPORTABLE NPRDS: N
N

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On July 12, 1991, at 1838 hours, with the plant operating at 100% power, the plant tripped. At the time of the trip, troubleshooting of an indication of low bearing oil pressure on the K-7A main feedwater pump turbine was in progress. Based on alternate indications, the System Engineer felt that the indication was incorrect. He tapped the pressure gauge with his hard hat which caused the main feedwater pump turbine to trip. The reactor tripped 54 seconds later on low steam generator level.

The cause of the event was a combination of personnel error and equipment failure.

Corrective action from this event includes electrical check out of all feedwater pump turbine instruments and controls, replacement of selected

feedwater pump turbine trip circuit components, repair of control cabinet oil and steam leaks and briefing instrument and control (I&C) technicians on proper equipment control.

END OF ABSTRACT

EVENT DESCRIPTION

On July 12, 1991, at 1838 hours, with the plant operating at 100% power, the reactor tripped on low steam generator level. At the time of the trip, troubleshooting of an indication of low bearing oil pressure on the K-7A main feedwater pump turbine SL;PI! was in progress. Bearing oil pressure on pressure indicator PI-1446 for K-7A was found to be approximately 8 psig by an auxiliary operator. A feedwater pump turbine trip (mechanical) occurs at 9 psig and a low pressure alarm occurs at 12 psig. No low bearing oil pressure alarms were received in the control room. The System Engineer was requested to troubleshoot the problem. Following minor adjustment of the bearing oil pressure regulator SL;RG!, the pressure increased to approximately 10 psig. Based on alternate indications, the System Engineer felt that the PI-1446 indication was incorrect. He tapped PI-1446 with his hard hat. Main Feedpump Turbine (K-7A) immediately tripped (electrically), closing the steam admission valves.

The reactor tripped 54 seconds later on low steam generator level. During the K-7A trip, the System Engineer and Shift Supervisor observed the illumination of the local electric trip indication light SL;XI! on the C-24 panel.

This event is reportable to the NRC per 10CFR50.73(a)(2)(iv) as an Engineered Safety Feature (ESF) actuation initiated by low steam generator level.

CAUSE OF THE EVENT

The cause of the event was a combination of personnel error and equipment failure.

The event involved the failure to report that PI-1446 had been dropped during re-installation following calibration and the failure of the main feedwater pump turbine (K-7A) reset push button.

ANALYSIS OF THE EVENT

Three hours prior to the feedwater pump turbine trip, instrument and control (I&C) technicians were performing their annual gauge calibration of the feedwater pump turbine control panel, C-24. On July 12, 1991, at 1500 hours, bearing oil pressure gauge, PI-1446, was bench calibrated satisfactorily and made ready for re-installation. During re-installation, the I&C technician dropped PI-1446. Instead of re-checking the gauge calibration, the technician re-installed PI-1446 into the C-24 panel and observed that the gauge was reading approximately 10 psig low. As this was at the end of their work shift on Friday, the technicians picked up the work area and left, expecting to re-calibrate PI-1446 the following Monday. Neither Operations nor the I&C supervisor were informed of the dropped gauge or the low pressure indication.

On the following shift on July 12, 1991, an auxiliary operator (AO) noticed that PI-1446 was reading low. Operations requested System Engineering support. The System Engineer immediately returned to the site, inspected K-7A and directed the AO to adjust the pressure control valve in an attempt to increase bearing oil pressure. Minor adjustment to the pressure control valve only increased PI-1446 indicated pressure from 8 to approximately 10 psig, normal pressure being approximately 20 psig. Suspecting a gauge problem, the System Engineer then "tapped" the gauge with his hard hat. As a result, the main feedwater pump turbine, K-7A, tripped. Both the System Engineer and Shift Supervisor noted the electronic trip indicator was illuminated on the C-24 panel.

Following the reactor trip, K-7A was reset and tripped two more times by the Shift Supervisor and the System Engineer (each time illuminating the electronic trip indicator) by tapping PI-1446 with a hard hat. On the third reset, K-7A would not trip by tapping PI-1446.

The local, manual trip push button was then depressed and K-7A tripped with the electronic trip indicator illuminating.

The exact cause of the electric trip is not known, as it could not be duplicated during electrical maintenance check-out of the trip circuitry. Inputs to the electric trip are: the remote trip push button, local trip push button, low feedpump suction pressure and thrust bearing failure. These trips do not appear to be the root cause of the K-7A electric trip. This judgement is based on the following:

1) The remote trip button was tested and found satisfactory by electrical maintenance. Operability was verified on July 16, 1991.

2) The local trip button was tested and found satisfactory by electrical maintenance. Operability was verified on July 16, 1991.

3) A low suction pressure trip would have tripped both feedwater pump turbines simultaneously. Critical Function Monitor (CFMS) data did not indicate a suction pressure drop at the time of the trip and only one feedwater pump tripped.

4) A thrust bearing failure trip contains a seal-in feature that did not come in at the time of trip. Also, the control room did not receive an alarm for a thrust trip. Subsequent check-out by I&C, electrical maintenance and a Bentley Nevada Service representative verified the calibration and operability of thrust trip and seal-in feature.

Further investigation found the C-24 cabinet, components, cables and devi
es covered with an oil film and dirt. The oil film appeared to be both old and new. A drip tray had previously been installed to catch oil and steam fitting leaks before dripping onto the internal electrical devices, but did not protect them adequately.

The following activities were performed:

1. Calibration of all steam and oil pressure switches and indicators in C-24 panel.

2. Disassembly of the reset push button identified oil and dirt on the push button contacts. Also, two of the four contacts were found burned, indicating internal arcing had occurred over its service life.

3. The control system was meggered at 150V and 500V (DC) with no grounds detected.

4. Wiring inside of C-24 was completely checked with no root cause findings for the K-7A trip. However, several electrical drawing deficiencies were discovered during the investigation.

5. Operate/Reset relay (CRL1) was bench tested to determine its sensitivity for energization. It was found to be fully functional.

6. All other C-24 electrical components were electrically tested and

found acceptable.

7. The C-24 cabinet was thoroughly cleaned, removing all oil and dirt.

8. A new 'catch' tray was assembled and installed between the gauges and electrical components. All oil leaks and steam leaks inside the cabinet were repaired.

9. As a conservative action, the trip latching relay, trip indicating light socket, remote reset push button, local trip push button and remote trip push button were replaced. All new devices were tested before and after installation.

10. An event recorder was installed on the K-7A controls to monitor and identify trip signals, should they occur.

11. Redundant pressure indicators were installed in parallel for bearing oil header pressure, lube oil filter inlet pressure and lube oil filter outlet pressure.

12. Signs were immediately posted after the trip on C-24 (K-7A) and C-25 (K-7B) control panels, warning personnel of the sensitivity of the circuitry in these panels.

13. The I&C technicians responsible for re-installing the dropped pressure gauge were counselled by their supervisor. In addition, all I&C technicians were briefed on the importance of informing management of defective equipment, whether caused by human error or found during the course of their work.

After these actions were taken, a special plant review committee (PRC) reviewed the corrective action and approved power escalation above 60% power. K-7A was put back in service on July 16, 1991 with no further electrical problems. On July 17, 1991 power was reduced from 90% to 80% due to indications that had appeared on the temporary event recorder. A subsequent review of the corrective actions that PRC had previously recommended indicated that these actions had either not been taken or were not properly documented. On July 19, 1991, power was reduced from 80% to 60% and K-7A was taken out of service to investigate the cause of a mechanical noise that developed. Further electrical system check out, as previously recommended by PRC, was performed and documented. No further electrical problems were found. The cause of the mechanical noise was not a contributor to this event.

The root cause of the July 12, 1991, main feedwater pump turbine (K-7A) trip is believed to be a high resistive short across the reset push button contacts. This conclusion is based on the dirt, oil and burned contacts found inside of the reset push button. It is postulated that oil droplets were suspended and/or near these contacts prior to the trip. Tapping the C-24 panel with a hard hat dislodged the droplets. The oil carried contaminates which caused a short. A short across the reset push button contacts would energize the operating coil on the trip latching relay (CRL1), closing the CRL1 contacts and subsequently energizing the turbine trip solenoid.

CORRECTIVE ACTION

1. Review equipment maintenance history to determine if this trip has any similarities to the K-7A trip on January 9, 1990 and K-7B trip on February 28, 1990.

2. Perform a continuity check, circuit check and device check on local, remote and automatic trips of K-7B. Clean and check wiring, devices, and terminations in C-25 panel/cabinet.

3. Evaluate modification(s) required to separate oil/steam gauges from electrical devices in C-24/C-25 cabinets.

4. Change frequency of periodic activity of gauge calibration in C-24 and C-25 to be performed at a refueling outage.

5. Evaluate method of equipment control for Palisades Periodic Activity Control System (PPACS) released for several days before completion of a PPAC.

6. Check for and repair leaky fittings inside of the C-25 cabinet. Also, install a drip collection tray between the gauge and electrical components.

7. Revise electrical drawing deficiencies identified by electrical maintenance during troubleshooting of C-24.

8. Evaluate K-7A/B trip circuit to determine if circuit may be simplified and/or modified to improve reliability.

ADDITIONAL INFORMATION

Previous feedwater pump trips have been reported in the following

licensee event reports (LERs):

LER 90-001 MANUAL REACTOR TRIP FOLLOWING TRIP OF MAIN FEEDWATER
PUMP (Supplemental report dated 03/01/91.)

LER 90-002 PRIMARY COOLANT SYSTEM COOLDOWN DURING MAIN FEEDWATER
PUMP TRIP RECOVERY RESULTS IN A VARIABLE HIGH POWER INITIATED REACTOR TRIP

ATTACHMENT 1 TO 9108220112 PAGE 1 OF 1

Consumers
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General Manager
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MICHIGAN'S PROGRESS
Palisades Nuclear Plant: 27780 Blue Star Memorial Highway,
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August 12, 1991

Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT -
LICENSEE EVENT REPORT 91-015 - PLANT TRIP FOLLOWING MAIN FEEDWATER PUMP
TRIP

Licensee Event Report (LER) 91-015 PLANT TRIP FOLLOWING MAIN FEEDWATER
PUMP TURBINE TRIP is attached. This event is reportable to the NRC per 10CFR50.73(a)(2)(iv).

Gerald B Slade
General Manager

CC Administrator, Region III, USNRC
NRC Resident Inspector - Palisades

Attachment

A CMS ENERGY COMPANY

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